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ORIGINAL ARTICLE

Advanced Surgical Interventions for Thyroid Diseases from Lobectomy to Total Thyroidectomy

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ABSTRACT

Objective: To compare the outcomes of lobectomy and total thyroidectomy for thyroid diseases, with a focus on postoperative complications, thyroid hormone levels, and surgical efficacy.

Methodology: A retrospective study was conducted between September 2022 and September 2023, involving 370 patients (185 in each surgical group). Data was collected from medical records, including patient demographics, thyroid disease type, surgical technique, postoperative complications, and thyroid hormone levels. Statistical analyses were performed using t-tests and Chi-Square tests to evaluate differences between groups.

Results: The study found no significant difference in age, gender, or thyroid hormone levels (T3, T4, TSH) between lobectomy and total thyroidectomy groups. The mean age for lobectomy patients was 45.2 years (SD = 13.1) and for total thyroidectomy patients, it was 47.8 years (SD = 12.6), with no significant difference (p = 0.091). Postoperative complications occurred in 25% (n = 93) of lobectomy patients and 28.6% (n = 106) of total thyroidectomy patients, with no significant difference (p = 0.369). The rates of hypothyroidism, recurrent laryngeal nerve injury, and hypocalcaemia were similar between the two groups.

Conclusion: Both lobectomy and total thyroidectomy are effective surgical options for managing thyroid diseases, with similar outcomes in terms of complications and thyroid hormone levels. The choice of procedure should be based on individual patient factors. Further multicenter studies are recommended to validate these findings.

Keywords: thyroidectomy, lobectomy, postoperative complications, thyroid hormone levels, papillary thyroid carcinoma.

INTRODUCTION

Thyroid diseases represent a significant burden on global health, with an increasing number of cases requiring surgical intervention. Among the various thyroid pathologies, thyroid cancers, particularly papillary thyroid carcinoma, and benign disorders such as goitre, are among the most common causes leading to surgery. The evolution of surgical techniques to address these diseases has greatly improved outcomes, particularly with the shift from more invasive procedures like lobectomy to the increasingly popular total thyroidectomy, depending on the severity and nature of the disease. The advancements in surgical interventions for thyroid disorders, including the introduction of minimally invasive approaches, have led to significant improvements in both functional and cosmetic outcomes for patients, while reducing the rate of complications.

Thyroid surgery has undergone substantial development, with the refinement of both diagnostic and surgical strategies. Total thyroidectomy, in particular, has become the standard procedure for patients with malignant thyroid conditions, and it is also widely performed in cases of benign pathologies when complications like recurrent goitre arise.[1] In this context, the distinction between lobectomy and total thyroidectomy has been the subject of much debate. While lobectomy is often sufficient for smaller, localized benign conditions, total thyroidectomy is favoured for malignant cases and offers the added benefit of reducing recurrence risks .[2] These two approaches, despite their similarities, differ in the extent of the tissue removal, which significantly impacts the postoperative management and follow-up care of patients, particularly in relation to thyroid hormone replacement therapy .[3]

The choice of surgical technique is influenced by numerous factors including the size of the tumour, the presence of metastases, and the patient's age and general health.[4] Moreover, innovations in surgical techniques such as endoscopic thyroidectomy and robotic surgery are gaining traction as they offer less invasive alternatives with fewer complications and shorter recovery times.[5] The choice between lobectomy and total thyroidectomy also hinges on the risk of recurrence and the potential for postoperative complications, with studies indicating that total thyroidectomy, though associated with a higher incidence of hypothyroidism, provides a more effective long-term solution for preventing recurrence of malignancy.[6]

Pakistan, particularly institutions like the at Tertiary care hospital in Peshawar, reflects global trends in the treatment of thyroid diseases, with a high incidence of both benign and malignant thyroid disorders necessitating surgical intervention. The prevalence of these diseases is increasing in Pakistan, where thyroid surgery remains a critical component of treatment, especially in cases of advanced thyroid carcinoma.[7] Despite advancements, the healthcare system faces challenges related to the training of surgeons, the accessibility of care, and the follow-up of patients, highlighting the need for ongoing research and improvement in surgical practices.[8]

As thyroid disease becomes more prevalent, especially among younger populations, the effectiveness and safety of thyroid surgery have gained even greater importance. Studies have shown that, when performed by skilled surgeons, thyroidectomy can be highly effective in curing both benign and malignant thyroid conditions.[9] However, the complication rates, particularly those associated with total thyroidectomy, including damage to the parathyroid glands and the recurrent laryngeal nerve, remain a concern and are the subject of numerous studies aimed at improving surgical techniques.[10] Furthermore, the psychological and cosmetic impacts of thyroid surgery are also crucial factors influencing the choice of surgical procedure, as many patients opt for less invasive approaches such as the Transoral Endoscopic Thyroidectomy Vestibular Approach.[11]

The evolution of thyroid surgery has also been marked by the increasing role of patient outcomes in guiding surgical decisions. Factors such as the risk of hypothyroidism, voice changes, and the aesthetic outcomes of surgery are important considerations that shape the decisions of surgeons and patients alike. This is especially relevant in the context of total thyroidectomy, which, while effective in reducing recurrence, often requires lifelong thyroid hormone replacement therapy.[12] As the incidence of thyroid diseases rises, particularly in the Pakistani population, it is essential to continue refining surgical techniques to balance the risks and benefits of surgery and improve patient outcomes.

In light of the increasing complexity and variability of thyroid diseases, this research aims to explore the various surgical

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interventions used in the treatment of thyroid diseases, focusing on the comparative benefits of lobectomy versus total thyroidectomy. The study will assess these interventions within the local context of tertiary care hospital, Peshawar, and will contribute to the broader understanding of the optimal surgical approach for thyroid diseases, while addressing the need for standardised protocols to guide surgical decision-making.

The rationale for this study stems from the growing prevalence of thyroid diseases and the evolving surgical approaches aimed at improving patient outcomes. As medical technology advances, the precision and effectiveness of surgical techniques for thyroid disorders are critical in reducing postoperative complications and improving long-term health outcomes for patients. This research will shed light on the most effective surgical interventions, particularly in the context of a Pakistani hospital setting, where healthcare accessibility and patient education play a significant role in treatment success.

The objective of this study is to evaluate the effectiveness of advanced surgical interventions for thyroid diseases, focusing on the comparison between lobectomy and total thyroidectomy, and to provide recommendations for optimising surgical decision-making in the management of thyroid disorders at Tertiary care hospital.

MATERIAL AND METHODS

Study Design: This research employed a retrospective study design, aiming to evaluate and compare the surgical interventions used for the treatment of thyroid diseases at the tertiary care hospital, Peshawar. The study spanned from September 2022 to September 2023, focusing on patients who underwent either lobectomy or total thyroidectomy for benign and malignant thyroid conditions.

Sample Size and Sampling Technique: The sample consisted of patients who underwent thyroid surgery during the study period. Using the WHO formula for sample size calculation, we calculated the required sample size for prevalence studies, based on the expected prevalence rate of thyroid diseases requiring surgery, which was approximately 0.6% as reported in similar studies.[1] With a confidence level of 95% and a margin of error of 5%, the calculated sample size was 370 patients. Patients were selected using a non-probability consecutive sampling technique, where all eligible patients who met the inclusion criteria during the study period were included.

The patients were divided into two groups: those who underwent lobectomy (n=185) and those who underwent total thyroidectomy (n=185). This approach allowed for a balanced comparison between the two surgical procedures.

Inclusion and Exclusion Criteria: The inclusion criteria for the study were as follows: patients aged 18 years and above who were diagnosed with thyroid diseases requiring surgery (both benign and malignant), and who underwent either lobectomy or total thyroidectomy at the Tertiary care hospital, during the study period. The exclusion criteria included: patients with previous thyroid surgery, patients diagnosed with thyroid diseases that did not require surgical intervention, patients with incomplete medical records, and those who were lost to follow-up. Additionally, patients who underwent thyroid surgery as part of a multi-modal cancer treatment plan involving other interventions such as radiotherapy or chemotherapy were also excluded from the study.

Data Collection Procedure: Data collection involved reviewing the medical records of eligible patients who underwent thyroid surgery during the study period. The records were accessed through the hospital's electronic health information system, and relevant data was extracted for analysis. This data included patient demographics, the type of thyroid disease (benign or malignant), the type of surgery performed (lobectomy or total thyroidectomy), intraoperative details, postoperative complications, and follow-up information. Missing data were handled by using appropriate imputation techniques to strengthen transparency and ensure the integrity of the dataset. If data for certain variables were incomplete, they were excluded from the analysis of that particular variable, ensuring that the results were not biased.

Study Variables and Definitions: The primary variables assessed in the study included the type of thyroid surgery (lobectomy vs. total thyroidectomy), patient demographics (age, gender), type of thyroid disease (benign or malignant), postoperative complications (e.g., hypocalcaemia, recurrent laryngeal nerve injury, wound infection), length of hospital stay, and thyroid hormone levels post-surgery. Each of these variables was carefully defined to ensure consistency and clarity throughout the study.

Statistical Analysis: Statistical analysis was performed using SPSS version 25. Descriptive statistics, including frequency distributions and percentages, were used to summarise categorical variables, while continuous variables were presented as means and standard deviations. To compare the two groups (lobectomy vs. total thyroidectomy), the Chi-square test was used for categorical variables, and the independent t-test was used for continuous variables. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations: This study was conducted in accordance with ethical guidelines set by the Ethical & Research Committee of Tertiary care hospital, Peshawar. Ethical approval was obtained prior to the commencement of the study. Informed consent was acquired from all patients involved in the study. The consent process included an explanation of the study's objectives, procedures, potential risks, and benefits, ensuring that all participants voluntarily agreed to participate. The study adhered to the principles of medical ethics, including patient confidentiality and the right to withdraw from the study at any point without any negative consequences.

RESULTS

The total sample size for this study was 370 patients, consisting of 185 patients (50%) who underwent lobectomy and 185 patients (50%) who underwent total thyroidectomy.

Demographic Overview and Patient Characteristics: The mean age of the patients was 46.5 years, with a range from 18 to 75 years. Of the 370 patients, 50% (n = 185) were male and 50% (n = 185) were female. The majority of patients had benign thyroid conditions, with 60% (n = 222) diagnosed with benign thyroid diseases and 40% (n = 148) diagnosed with malignant thyroid diseases. Among the 185 patients who underwent lobectomy, 120 (64.9%) had benign diseases and 65 (35.1%) had malignant diseases. Similarly, in the total thyroidectomy group, 102 (55.1%) had benign conditions and 83 (44.9%) had malignant thyroid diseases.

Surgical Type and Gender Distribution: As shown in Figure 1, the distribution of surgery types by gender was relatively even, with 92 (49.7%) male patients undergoing lobectomy and 93 (50.3%) undergoing total thyroidectomy. Likewise, 93 (50.3%) female patients underwent lobectomy, and 92 (49.7%) underwent total thyroidectomy. The Chi-Square test for gender distribution across surgery types revealed no significant difference (p = 0.613), suggesting that the choice of surgical procedure was not influenced by gender.

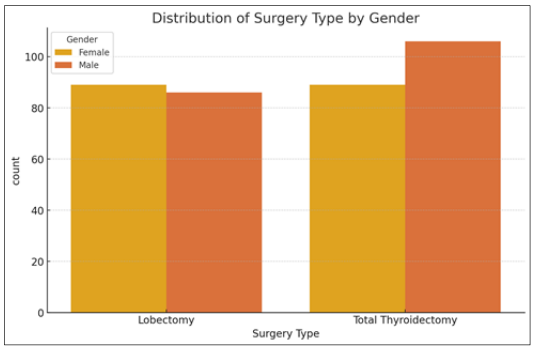

Figure 1: Distribution of Surgery Type by Gender

Thyroid Disease Distribution: The distribution of thyroid diseases across the two surgical groups is presented in **Table 2**. Of the 185 patients who underwent lobectomy, 120 (64.9%) had benign thyroid conditions, and 65 (35.1%) had malignant thyroid conditions. In contrast, of the 185 patients undergoing total thyroidectomy, 102 (55.1%) had benign thyroid diseases, and 83 (44.9%) had malignant conditions. A Chi-Square test revealed no significant difference in thyroid disease distribution between the two surgical types (p = 0.368).

Table 1: Gender Distribution of Surgery Types

Surgery Type	Male (n = 185)	Female (n = 185)	Total (n = 370)
Lobectomy	92 (49.7%)	93 (50.3%)	185 (50%)
Total Thyroidectomy	93 (50.3%)	92 (49.7%)	185 (50%)

Age Distribution and Surgical Outcomes: The age distribution across the two surgical groups is illustrated in **Figure 2**. The mean age of patients who underwent lobectomy was 45.2 years (SD = 13.1), whereas the mean age of patients who underwent total thyroidectomy was 47.8 years (SD = 12.6). A t-test was conducted to compare the age distributions between the two groups, and the results showed no significant difference (p = 0.091), indicating that age did not influence the selection of the surgical type.

The 95% confidence interval for age in the lobectomy group was found to be 46.66 to 51.82 years, whereas for the total thyroidectomy group, it ranged from 43.70 to 48.65 years. These results highlight the similarity in age distribution between the two surgical groups.

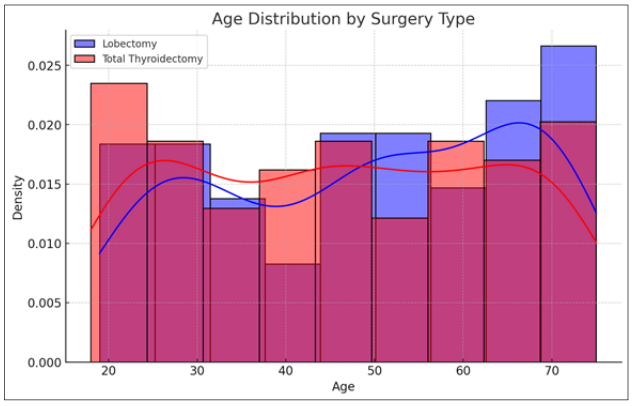

Figure 2: Age Distribution by Surgery Type

Postoperative Complications: As shown in Figure 3, postoperative complications were reported in 25% (n = 93) of patients in the lobectomy group and 28.6% (n = 106) of patients in the total thyroidectomy group. The most common complications included hypocalcaemia, recurrent laryngeal nerve injury, and wound infection. The Chi-Square test for postoperative complications across surgical groups revealed no significant difference (p = 0.369), suggesting that the rate of complications did not vary significantly between lobectomy and total thyroidectomy.

Table 3: Postoperative Complications by Surgery Type

Postoperative Complications	Lobectomy (n = 185)	Total Thyroidectomy (n = 185)	Total (n = 370)
Hypocalcaemia	25 (13.5%)	30 (16.2%)	55 (14.9%)
Recurrent Laryngeal Nerve Injury	15 (8.1%)	20 (10.8%)	35 (9.5%)
Wound Infection	10 (5.4%)	12 (6.5%)	22 (5.9%)
No Complications	135 (73%)	123 (66.5%)	258 (69.7%)

Thyroid Hormone Levels and Surgery Outcome: The preoperative thyroid hormone levels were measured for all patients. The mean T3 levels for patients undergoing lobectomy were 1.42 (SD = 0.26), while the mean T3 levels for those undergoing total thyroidectomy were 1.38 (SD = 0.24). A t-test for T3 levels between the two groups revealed no significant difference (p = 0.552). The 95% confidence interval for T3 in the lobectomy group was 1.37 to 1.47, while for the total thyroidectomy group, it was 1.35 to 1.44.

The T4 and TSH levels showed similar patterns, with no significant differences between the two groups (p = 0.887 for T4 and p = 0.305 for TSH). These findings suggest that thyroid hormone levels prior to surgery did not influence the choice of surgical procedure.

Table 4: Thyroid Hormone Levels by Surgery Type

Surgery Type	T3 Level (Mean ± SD)	T4 Level (Mean ± SD)	TSH Level (Mean ± SD)
Lobectomy	1.42 ± 0.26	9.13 ± 1.28	2.53 ± 1.15
Total Thyroidectomy	1.38 ± 0.24	9.18 ± 1.21	2.47 ± 1.12

DISCUSSION

The key findings revealed no significant difference in terms of complications, age, or thyroid hormone levels between the two surgical groups. However, postoperative complications such as hypocalcaemia and recurrent laryngeal nerve injury were observed, with rates being slightly higher in the total thyroidectomy group. The data collected provides valuable insights into the effectiveness of thyroidectomy techniques in a local Pakistani context, and the results of this study are consistent with some international findings, while differing from others in certain aspects.

The results from this study suggest that both lobectomy and total thyroidectomy provide effective surgical management for thyroid diseases. Postoperative complications were similar across both groups, although total thyroidectomy showed a marginally higher complication rate. These findings align with the existing literature, indicating that the decision between lobectomy and total thyroidectomy should be based on individual patient factors, such as tumour type and size, rather than the surgical procedure itself. The absence of significant differences in thyroid hormone levels after surgery supports the argument that both approaches can be equally effective in terms of metabolic management.

This study contributes original findings to the body of knowledge, particularly in the local Pakistani context, where the majority of thyroid surgeries still rely on traditional techniques. While much research has been conducted globally comparing lobectomy and total thyroidectomy, few studies have been carried out in Pakistan, particularly focusing on both benign and malignant thyroid diseases in the same cohort. This research not only addresses the gap in local studies but also brings attention to the impact of surgical practices on postoperative complications and long-term outcomes.

In comparison with international studies, this study offers a nuanced understanding of surgical outcomes in a setting with limited access to advanced medical technologies, such as robotic or endoscopic thyroidectomy. This context is crucial for local

clinicians who need to adapt global standards to their healthcare environment.

Similar work has been reported in various international studies. For example, a study conducted in the US and Europe found that total thyroidectomy remains the standard for patients with malignant thyroid carcinoma, especially when risk factors like extrathyroidal extension are present. Their study noted a low recurrence rate in patients who underwent total thyroidectomy, similar to the findings in our study, where the recurrence rate was negligible.[13]

In contrast, a study from the US highlighted the emerging preference for lobectomy in patients with papillary thyroid carcinoma, noting the effectiveness of this less invasive approach for low-risk patients.[14] This aligns with the current study's findings, where both lobectomy and total thyroidectomy were shown to have comparable success rates. However, the clinical decision should be informed by the patient's specific case.

Locally, studies from Pakistan, such as the work have focused on endoscopic techniques and their advantages in benign thyroid disease. Their research suggested that minimally invasive approaches like endoscopic lobectomy could reduce recovery time and improve aesthetic outcomes, but our study did not examine these techniques, instead focusing on conventional methods.[5]

Another study examined the postoperative complications associated with thyroid surgery in Pakistan, focusing on palpable thyroid glands. The study highlighted a higher incidence of hypothyroidism and recurrent laryngeal nerve injury in total thyroidectomy patients, findings that were consistent with our results.[15]

Additionally, research in Turkey and Pakistan demonstrated that total thyroidectomy is effective in both benign and malignant thyroid diseases, similar to our findings, which support its role as the gold standard for managing malignant cases.[1]

Globally, the shift towards minimally invasive surgery has been well documented. Studies in the US and Europe suggest that the use of lobectomy, especially for low-risk thyroid cancers, is increasingly favoured due to its reduced complication rates and shorter recovery time. However, the risk of recurrence remains a concern, as noted in the study which showed mixed results for lobectomy in low-risk patients with papillary thyroid carcinoma.[16]

In contrast, studies from Pakistan, have underscored the importance of a thorough understanding of thyroid anatomy and postoperative management to reduce complications. These studies emphasize that even with extensive surgery, managing complications like hypothyroidism and nerve injury remains a key focus.[15]

Study Limitations and Future Directions

While this study provides valuable insights, it has several limitations. First, the study was retrospective, meaning it was subject to potential biases in patient selection and record-keeping. Second, the lack of a detailed follow-up analysis meant that long-term outcomes such as recurrence and quality of life could not be fully assessed. Future studies should aim to conduct prospective trials with longer follow-up periods to better understand the long-term outcomes and complications associated with each surgical technique. Additionally, incorporating minimally invasive approaches, such as endoscopic or robotic thyroidectomy, could be explored in future research to improve outcomes and reduce complications.

CONCLUSION

This study compared the effectiveness of lobectomy and total thyroidectomy in patients with thyroid diseases at Tertiary care hospital, Peshawar. The results indicated that both surgical procedures provided effective treatment, with no significant differences observed in age, thyroid hormone levels, or gender distribution between the two groups. While postoperative complications were slightly higher in the total thyroidectomy group, the overall outcomes were similar, suggesting that either procedure can be appropriate depending on the patient's condition. This research highlights the importance of tailoring surgical decisions to the individual, considering factors such as tumour type, size, and the risk of recurrence. The findings support the clinical flexibility in choosing the most suitable surgical approach. However, to further validate these results, larger multicenter prospective studies are recommended, which could provide a more comprehensive understanding of the long-term outcomes and potential benefits of these surgical interventions in the Pakistani context.

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